

CLAIMS

What is claimed is:

1. An indoor air quality module comprising:
a compartment having an inlet and an outlet;
a monolith located between the inlet and the outlet;
a photocatalytic coating on the monolith;
an ultraviolet light source which directs ultraviolet light towards the photocatalytic coating; and
a shield adjacent the monolith.
2. The module as recited in claim 1 wherein the shield reflects the ultraviolet light that passes through the monolith towards the monolith to minimize leakage of the ultraviolet light from the module.
3. The module as recited in claim 1 wherein the photocatalytic coating is titanium dioxide.
4. The module as recited in claim 1 wherein the monolith comprises a honeycomb.
5. The module as recited in claim 4 wherein the honeycomb comprises a plurality of hexagonal shaped passages coated with the photocatalytic coating.
6. The module as recited in claim 1 wherein the shield comprises a sheet metal.
7. The module as recited in claim 1 wherein the shield has an upper edge and an opposing lower edge.
8. The module as recited in claim 7 wherein an upper gap is defined between the upper edge and the compartment and a lower gap is defined between the opposing lower edge and the compartment.

9. The module as recited in claim 8 wherein the upper gap has an upper gap height and the lower gap has a lower gap height, and the upper gap height is substantially equal to the lower gap height.

10. The module as recited in claim 1 wherein the monolith comprises a first monolith and a second monolith, the ultraviolet light source located between the first monolith and the second monolith.

11. The module as recited in claim 1 wherein the monolith defines a monolith height and the shield defines a shield height, the shield height is less than the monolith height.

12. The module as recited in claim 11 wherein a distance is defined between the ultraviolet light source and the shield and a non-reflection angle is defined as a maximum angle from a horizontal that the ultraviolet light can pass through the monolith without contacting the monolith, and wherein the shield height relates to the distance and the non-reflection angle.

13. The module as recited in claim 1 wherein the shield height is defined by a variable H, the distance is defined by the variable D, and the non-reflection angle is defined by the variable α , and the shield height is determined by the following equation:

$$H = 2*D*tan(\alpha)$$

14. An indoor air quality module comprising:
- a compartment having an inlet and an outlet;
 - a first monolith located between the inlet and the outlet of the compartment and having a monolith height;
 - a second monolith located between the inlet and the outlet of the compartment and having the monolith height;
 - a photocatalytic coating on the first monolith and the second monolith;
 - an ultraviolet light source adjacent the first monolith and the second monolith which directs ultraviolet light towards the photocatalytic coating; and
 - a first shield having a shield height less than the monolith height; and
 - a second shield having the shield height, the first monolith and the second monolith located between the first shield and the second shield, and the first shield reflects the ultraviolet light that passes through the first monolith towards the first monolith to minimize leakage of the ultraviolet light from the module and the second shield reflects the ultraviolet light that passes through the second monolith towards the second monolith to minimize leakage of the ultraviolet light from the module.

15. The module as recited in claim 14 wherein the shield comprises an upper edge and an opposing lower edge, and an upper gap is defined between the upper edge and the compartment and a lower gap is defined between the opposing lower edge and the compartment, and wherein the upper gap has an upper gap height and the lower gap has a lower gap height, and the upper gap height is substantially equal to the lower gap height.

16. The module as recited in claim 14 wherein a first distance is defined between the ultraviolet light source and the first shield and a second distance is defined between the ultraviolet light source and the second shield, and a non-reflection angle is defined as a maximum angle from a horizontal that the ultraviolet light can pass through the first monolith and the second monolith without contacting the first monolith and the second monolith, and wherein the shield height of the first shield depends on the first distance and the non-reflection angle and the shield height of the second shield depends on the second distance and the non-reflection angle.

17. A method of purifying air comprising the steps of:
 - (a) flowing the air through a monolith having a photocatalytic coating;
 - (b) illuminating the photocatalytic coating on the monolith with ultraviolet light; and
 - (c) reflecting the ultraviolet light that passes through the monolith towards the monolith to minimize leakage of the ultraviolet light.
18. The method as recited in claim 17 wherein said step (b) produces hydroxyl radicals to destroy contaminants in the air and destroying the contaminants with the hydroxyl radicals.
19. The method as recited in claim 17 wherein an ultraviolet light source illuminates the photocatalytic coating and a shield reflects the ultraviolet light, and the method further comprises the steps of defining a distance between the ultraviolet light source and the shield and defining a non-reflection angle as a maximum angle from a horizontal that the ultraviolet light can pass through the monolith without contacting the monolith, and wherein a height of the shield relates to the distance and the non-reflection angle.
20. The method as recited in claim 17 wherein the ultraviolet light that passes through the monolith without reflection is defined as direct leakage.